Amendments to the Claims

This listing of the claims will replace all prior versions and listings of the claims in the application:

Listing of Claims:

Claims 1-12 (canceled)

Claim 13 (currently amended): An apparatus for ~~determining position of~~ controlling a valve member relative to a valve contact surface, wherein the member is operatively connected to an a piezoelectric actuator, comprising:

an actuator control circuit ~~operatively connected to~~ in electrical communication with the actuator, wherein the actuator control circuit ~~and operable to apply~~ applies a control signal to the actuator, the control signal controlling movement of the member relative to the contact surface, and ~~operable to receive~~ receives an output from the actuator; and

a seat detection circuit ~~operatively connected to~~ in electrical communication with the actuator control circuit, wherein the seat detection circuit determines ~~and operable to determine~~ contact of the member with the contact surface from the output;

wherein the actuator is a piezoelectric device.

Claim 14 (original): The apparatus, as set forth in claim 13, wherein the output comprises a voltage produced by the actuator.

Claim 15 (currently amended): The apparatus, as set forth in claim [[14]] 13, wherein the seat detection circuit determines a rate of change of the output.

Claim 16 (currently amended): The apparatus, as set forth in claim [[15]] 13, wherein the seat detection circuit determines contact of the member with the contact surface from a comparison of the rate of change of the output to a predetermined value.

Claim 17 (currently amended): An apparatus for controlling velocity of a valve member relative to a valve contact surface, wherein the member is operatively connected to an actuator, comprising:

an actuator control circuit ~~operatively connected to~~ in electrical communication with the actuator, wherein the actuator control circuit ~~and operable to apply~~ applies a control signal to the actuator, the control signal controlling movement of the member relative to the contact surface, and ~~operable to receive~~ receives an output from the actuator;

a seat detection circuit ~~operatively connected to~~ in electrical communication with the actuator control circuit, wherein the seat detection circuit determines ~~and operable to determine~~ contact of the member with the contact surface from the output; and

a velocity control circuit in electrical communication with ~~operatively coupled to~~ the actuator control circuit and seat detection circuit, wherein the velocity control circuit provides ~~and operable to provide~~ an input to the actuator control circuit for controlling velocity of the member;

wherein the actuator is a piezoelectric device.

Claim 18 (currently amended): The apparatus, as set forth in claim 17, further comprising:

a position control circuit ~~operatively connected to~~ in electrical communication with the actuator control circuit, the seat detection circuit, and the velocity control circuit, the position control circuit having a stored charge value and a current charge value.

Claim 19 (original): The apparatus, as set forth in claim 18, wherein the position control circuit determines a charge error as a function of the stored charge value and the current charge value.

Claim 20 (original): The apparatus, as set forth in claim 19, wherein the velocity control circuit determines the input as a function of the charge error.

Claim 21 (currently amended): The apparatus, as set forth in claim 18, wherein the position control circuit includes an integrator ~~operable to integrate~~ that integrates current flowing through the actuator during a current actuation cycle to determine the current charge value.

Claim 22 (original): The apparatus, as set forth in claim 21, wherein the stored charge value is determined by the seat detection circuit during a prior actuation circuit.

Claims 23-26 (canceled)

Claim 27 (new): The apparatus, as set forth in claim 14, wherein the seat detection circuit detects the impact of the member with the contact surface by detecting an abrupt change in the amplitude of the output voltage.

Claim 28 (new): The apparatus, as set forth in claim 13, wherein the output is used to adjust the control signal to slow the member as it approaches and impacts the contact surface.

Claim 29 (new): The apparatus, as set forth in claim 13, wherein the control signal and the output are supplied through a single pair of electrical leads.

Claim 30 (new): The apparatus, as set forth in claim 17, wherein the output comprises a voltage produced by the actuator.

Claim 31 (new): The apparatus, as set forth in claim 30, wherein the seat detection circuit detects the impact of the member with the contact surface by detecting an abrupt change in the amplitude of the output voltage.

Claim 32 (new): The apparatus, as set forth in claim 17, wherein the input is derived from the output and is utilized by the actuator control circuit to slow the member as it approaches and impacts the contact surface.

Claim 33 (new): The apparatus, as set forth in claim 17, wherein the position control circuit includes a comparator that compares a desired charge determined from the output of a prior actuation cycle with the current charge on the actuator to determine a difference and provide the difference to the velocity control circuit.

Claim 34 (new): The apparatus, as set forth in claim 33, wherein the difference is used by the velocity control circuit to determine the input.

Claim 35 (new): The apparatus, as set forth in claim 34, wherein the input is utilized by the actuator control circuit to slow the member as it approaches and impacts the contact surface.